

NEW QUATERNARY FOSSIL SITES NEAR SWARTKLIP,  
CAPE PROVINCE

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(With 7 plates and 2 figures)

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CONTENTS

	PAGE
Introduction . . . . .	43
Geological associations of the fossils . . . . .	45
Archaeological associations of the fossils . . . . .	45
The fossils recovered . . . . .	47
Origin of the fossils . . . . .	48
The faunal assemblages . . . . .	50
Systematic description of faunal types . . . . .	51
The postcranial remains . . . . .	68
Age of the assemblages . . . . .	70
Conclusion . . . . .	71
Summary . . . . .	71
Acknowledgements . . . . .	71
References . . . . .	72

INTRODUCTION

During April, 1966, students from the Department of Geology, University of Cape Town, discovered an horizon containing fossil bone in the sand- and limestone cliffs near Swartklip on the False Bay coast. Subsequent investigations revealed the existence of fossil-bearing deposits at three localities—Site I, the most prolific occurrence, and Sites II and II Extension, two separate exposures of a single horizon (fig. 1).

Earlier, Singer & Fuller (1962) had reported on an assemblage of fossil bone from a fallen block of the cliff-face in the Swartklip (Zwartklip) area. This discovery is herein referred to as the 'Singer/Fuller Occurrence'.

All the fossil material recovered from these occurrences is almost certainly at least broadly contemporary, and it is the purpose of the present report to place on record the material from the three new sites which had been recovered up to July, 1966. The fossils, which are housed in the South African Museum (Natural History), Cape Town, have in many cases been incompletely classified, largely because of the lack of adequate comparative material. It is hoped

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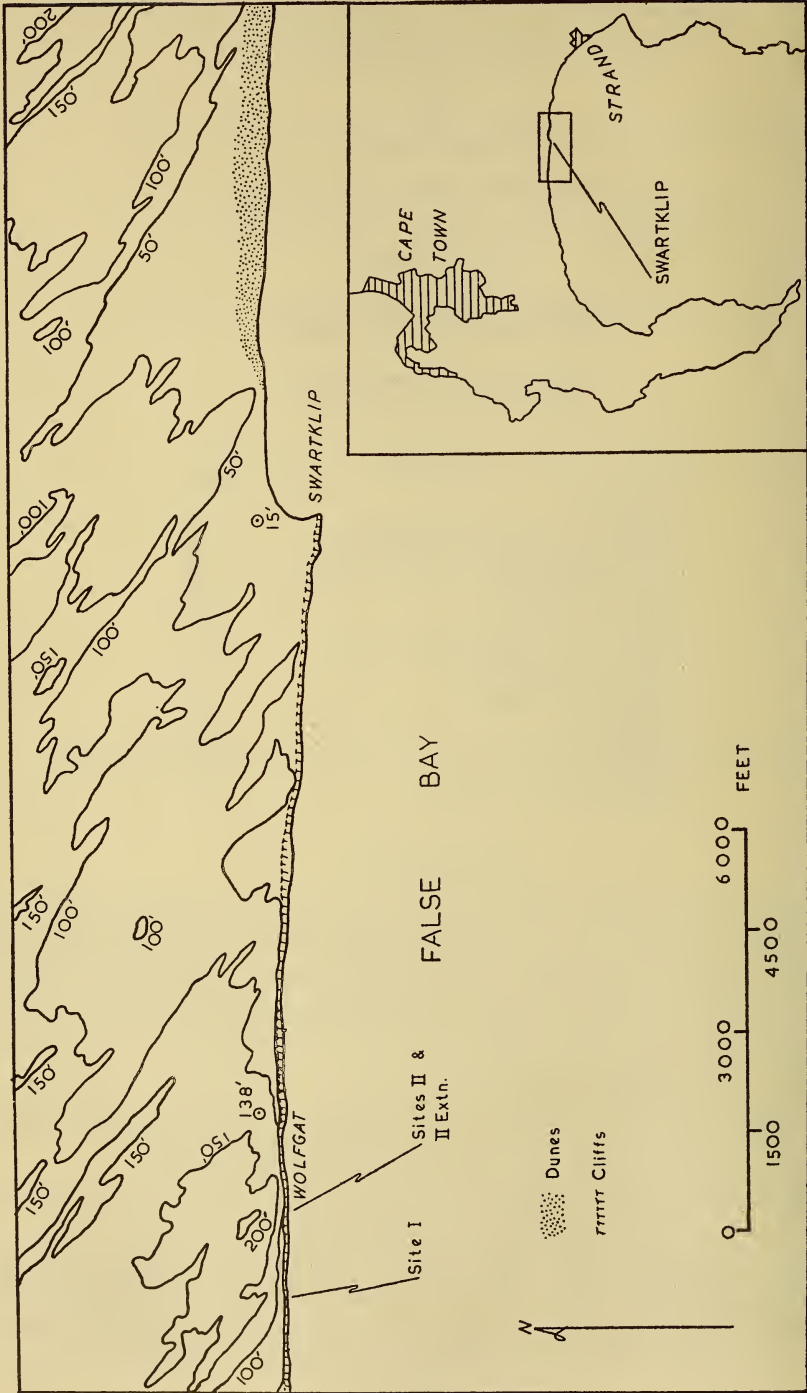


FIG. 1. Map showing location of new fossil sites near Swartklip, C.P. (Adapted from Trig. Survey Sheet no. 3418 B6).

to refer back to these specimens as detailed osteological studies of their modern and fossil counterparts progress.

#### GEOLOGICAL ASSOCIATIONS OF THE FOSSILS

The geology of the Swartklip deposits has already been recorded in some detail (Singer & Fuller, 1962). The fossils at the new sites occur in an irregular horizon of unbedded calcareous sand and grit, at approximately 60 feet above sea-level. At Site I an extensive talus slope has developed from beneath the small overhang in which the fossil horizon is exposed, and it was from the rubble of this scree that most of the fossils were recovered (pl. 1A, B). The deposits are, for the most part, incompletely consolidated, and their instability limited the collection of *in situ* fossils.

The fossiliferous horizon at Site I is clearly distinguishable from the overlying and underlying horizontally bedded deposits (fig. 2), and it appears to fill what was once a low cave. Comminuted marine shells occur in great quantities throughout the deposits incorporating the fossil horizon, and they are clearly marine in origin, although they may well have been redistributed in part by subsequent wind action. Their age is uncertain, but Singer & Fuller consider that they cannot post-date the 'Riss/Würm' interglacial. It is unlikely that they are older, since they would have had to withstand marine erosion during the high sea-level of that period, which is improbable in view of their relatively unconsolidated nature. The fossil deposits are clearly younger, but geological evidence can provide no closer estimate of age.

Overlying the horizontally bedded sands are discontinuously developed horizons of calcrete ('calcareous tufa' of Singer & Fuller) and calcareous sands, partially consolidated reddish-brown sand and unconsolidated white sand, all of which reflect the more recent geological and pedological history of the area. Shells of land snails occur within these deposits, which are aeolian in origin, and the calcareous and ferruginous characters reflect chemical changes within the soil body subsequent to its accumulation. The calcrete has resulted from the induration of the calcareous sands.

The geology at Sites II and II Extension is similar in most respects.

Singer & Fuller concluded that the fossils recovered by them probably came from a crevice in the cliff formation and that the occurrence post-dated the cliff sands, but pre-dated the calcrete. Observations at the new sites confirm the former speculation, but do not necessarily support the latter. At none of the sites is there evidence for a vertical opening through the deposits which has been sealed by the calcrete. At Site I there is a strong suggestion that the 'cave' opening was in a gully to the east of the fossiliferous deposit. The formation of the calcrete, therefore, had no direct effect on the 'cave' opening, and the fossils do not necessarily pre-date its formation.

#### ARCHAEOLOGICAL ASSOCIATIONS OF THE FOSSILS

A single undiagnostic silcrete flake was recovered from the talus slope at Site I, but no material of an archaeological nature was found definitely asso-

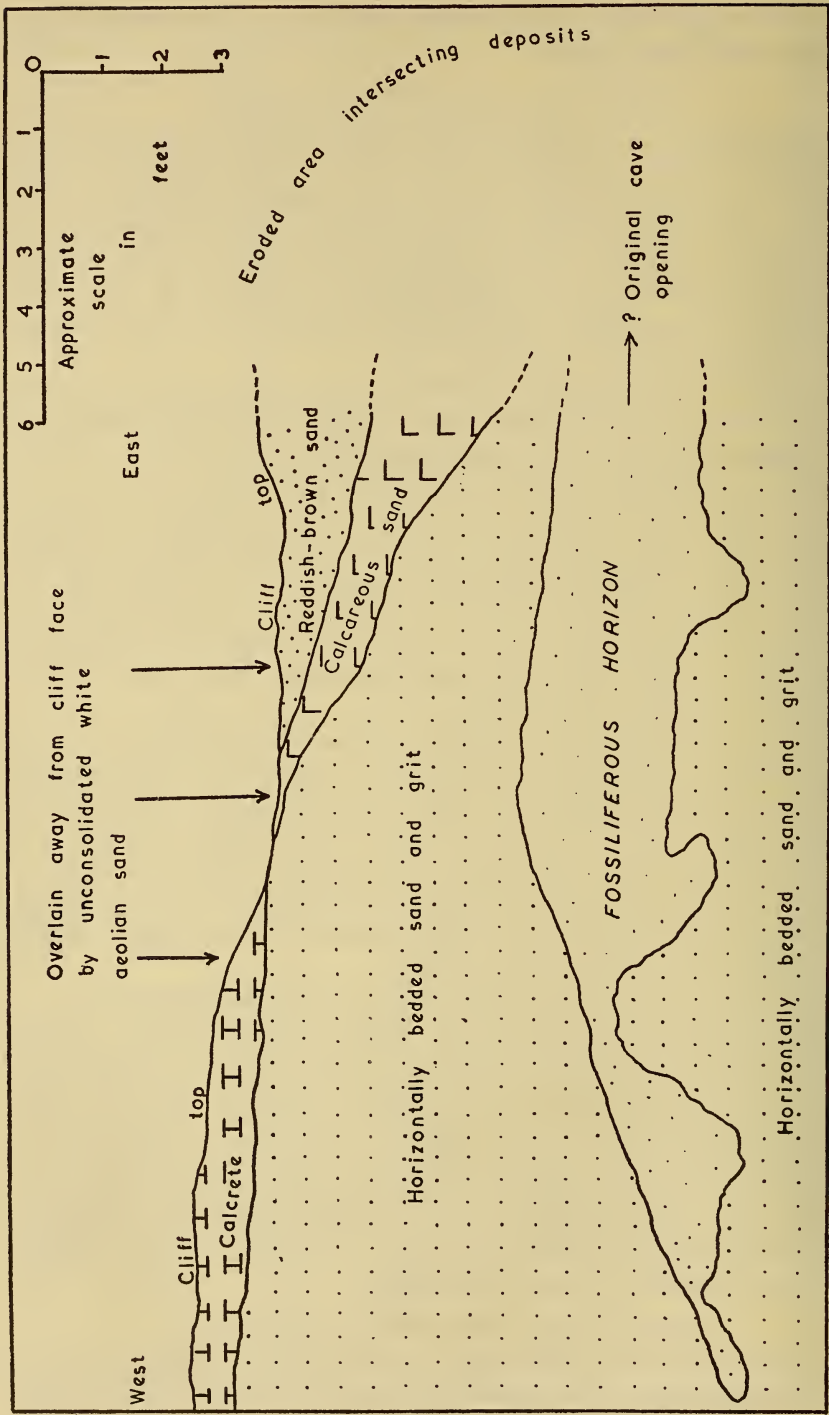


FIG. 2. Sketch section of Site I.

ciated with the fossils at this locality.

At Site II Extension, approximately 2 feet above the fossils, is a clearly defined horizon, apparently an old land surface, from which several flakes and numerous marine shells were recovered. This midden dates probably from the Late Stone Age, and may be indirectly associated with the fossils (*vide infra*).

From Site II a complete ostrich-egg, with a single perforation on its surface, was recovered (pl. 1C), and this resembles the 'water-containers' known from Late Stone Age contexts, and still used today by the Bushmen of the Kalahari Desert. The perforation is irregular and appears to have been made by being chipped away with a sharp object. This is the technique commonly employed in the manufacture of ostrich-egg water containers (Maggs, 1966), although in the present instance the perforation has not been rounded out.

If indeed this specimen is a water-container, its association with the fossils might be coincidental, having been buried into the fossil horizon from the Late Stone Age living floor immediately above.\* These containers were, and still are, buried when being stored.

None of the fossils show any evidence of human interference, neither artificially produced fractures (spiral fractures, punctate marks, flaking, etc.), nor wear through use having been observed.

There is, therefore, no certain evidence for associating the fossils with human activity.

#### THE FOSSILS RECOVERED

The fossils were, in general, extremely well preserved. This is accounted for by the alkali nature of the deposits, and by the original protection afforded them in the caves from natural destructive agencies such as wind, water and temperature changes.

Damage to the specimens has been largely post-fossilization, and occurred mainly as a result of the collapse of deposits from the cliff-face, and their subsequent exposure to the atmosphere. Absorption of salts from the sea air, and their later crystallization within the fossils has resulted in lamination and cracking of some specimens.

The fossils are not heavily mineralized, and this rendered the preparation of those specimens in well consolidated matrix very difficult.

They occurred most commonly towards the base of the horizon, with several pockets of concentration, and usually lay horizontally in the deposit. Several instances were noted where elements of the skeleton were in articulation or only slightly separated. Since no systematic excavation was undertaken it was not possible to assess the frequency with which this occurred. This feature is a further indication of accumulation under protected conditions.

\* The living floor was not actually detected at Site II, but since it and Site II Extension are exposures of the same horizon on either side of a small spur, it is almost certainly present.

## ORIGIN OF THE FOSSILS

The lack of positive cultural associations, taken in conjunction with the small size of the caves, indicates that some agency other than man was responsible for the bone accumulations. The nature of the fossils described by Singer & Fuller (1962) prompted the observation that, 'they could well have been deposited on the floor of a small cave or rock shelter used as a lair'. This view is supported by observations made in the present study.

In southern Africa an animal lair containing bones immediately suggests that the porcupine (*Hystrix africaeaustralis*) is, or was, the occupant. In the present instance this possibility was discounted, since the assemblages contained no gnawed bones. Porcupine lairs contain a high proportion of bones which show gnaw marks (Hendey & Singer, 1965).

Alternatives were sought among the Carnivora. One of the most striking features of the assemblages was the variety of carnivores represented. In the mammalian fauna of a region the numbers and types of carnivores form a relatively small percentage of the total, and this balance is usually reflected in the faunal assemblages of fossil sites (table 1). The situation at Swartklip suggests that the lairs were inhabited by a number of carnivores over a period of time, and that the assemblages contain the remains of animals which died there.

TABLE 1  
THE VARIETIES OF CARNIVORA FROM SITE 1 COMPARED WITH THOSE FROM  
OTHER SITES IN THE CAPE PROVINCE

	Swartklip Site 1	Open Sites		Cave Sites*	
		Melkbos	Hopefield	A.K. 1	A.K. 2
Animal lairs . . . . .	×				×
Human activity evident . .		×	×	×	
Varieties of carnivora . .	7	3	12	6	2
Other mammals (excl. micro- fauna) . . . . .	8	14	38	11	11
Carnivora as % of total . .	47	18	24	35	18

\* Hendey & Singer, 1965.

Perhaps the most significant evidence in support of the 'lair theory' is provided by the official name, Wolfgat, of the area in which the sites are located (fig. 1). This Afrikaans word, which literally translated is 'wolf-hole', but in free translation means 'hyena-lair', is an example of the naming of localities after animals, an extremely common practice amongst the early European settlers in South Africa (Sargent, 1954). The use of the term 'wolf' for hyenas is now largely an anachronism, but it does persist in the common Afrikaans names of these animals, i.e. 'gevlekte wolf' or 'tierwolf' = *Crocuta crocuta*; 'strandwolf' = *Hyena brunnea*; 'aardwolf' = *Proteles cristatus*.\*

\* Often classed in a separate family, the Protelidae, but undoubtedly considered a true hyaenid by early non-scientific observers.

Dart (1949) states that 'most South African carnivora, such as the lion, jackal and spotted hyena, actually avoid caverns and live out in the veld, killing their prey and consuming it in the open country. Two South African types, namely the leopard and brown hyena, are attracted by the protection of rock shelters and of fissures. . . .' Remains of the brown hyena occur in both the Site I and Site II assemblages, and since it is also well known as a scavenger on sea-shores, it is the animal considered most likely to have given rise to the name 'Wolfgat'. Furthermore, the presence in the assemblages of isolated bones of large animals, such as the rhinoceros, suggests that at least one of the inhabitants of the lair was a scavenger.

The suggestion that the brown hyena was one of the 'bone-collectors' must, however, be accepted with reservations. Dart (1956) has gone to great lengths to prove that it does not accumulate bones in its lairs, and that it does not defecate in its lairs. Both Sites I and II Extension have yielded coprolites, and although the animal responsible for these was not identified, they were of a size sufficient at least to suggest the brown hyena.

The aardwolf also inhabits burrows, and although it is unlikely to have been responsible for the bone accumulations, being largely insectivorous, it is reported also to be a carrion eater (Miller, 1954; Maberly, 1963).

In any event, it is certain that within historic times there was a lair of a 'hyaenid' in the area where the fossil sites are located. Whether or not this can be related to the fossil occurrences is a matter for conjecture.

Speculations on other possible occupants of the lairs have proved equally inconclusive. The African hunting dog (*Lycan pictus*), recorded from Site I, does not normally inhabit lairs, but the females do occupy burrows during the natal and early post-natal periods.

The lion (*Felis leo*), although not an occupier of lairs today, must be considered as a possibility simply because of the number of individuals recorded. Remains of the lion are extremely rare at fossil sites in South Africa, whereas at least five individuals are represented in the relatively small Swartklip assemblages.

Fragments of ostrich-eggshell were recovered at all three sites, and unless these are all from broken water containers, which is considered highly unlikely, their presence suggests that eggs formed part of the diet of one of the occupants.

The presence of fossils at and near the top of the fossiliferous horizon is an apparently anomalous situation in the lair theory. There would, however, have been some fall of sand from the walls and roof of the caves, and with the accumulation of sand, bones and other debris in the lair, the occupying animal would have been forced to clear the floor from time to time. In the clearing of new living space, bones would have been thrown up and in some cases reached roof level. This regular disturbance would also account for the completely amorphous character of the sand constituting the fossiliferous horizon.

It is possible that the lair at Sites II and II Extension was occupied at the time that the land surface on which the midden accumulated was in

existence (*vide supra*). If this was the case, there may well be some tenuous link between human activity and the fossils, such as, for example, the scavenging of food remains from nearby human occupation sites by the animal inhabiting the lair at that time.

#### THE FAUNAL ASSEMBLAGES

An analysis of the material recovered confirms the observation of Singer & Fuller (1962) on the great diversity of faunal types represented in a relatively small total assemblage from a limited area (table 2).

Of the new sites, Site I was the most productive (table 3).

TABLE 2

	Site I	Site II	Site II Extn.	Singer/Fuller Occur.
Class <i>MAMMALIA</i>				
Order <i>ARTIODACTYLA</i>				
Family <i>Bovidae</i>				
<i>Redunca cf. arundinum</i> .. ..	×	×	×	×
<i>Hippotragus cf. leucophaeus</i> .. ..	×			
<i>cf. Connochaetes</i> sp. .. ..	×			×
<i>Antidorcas marsupialis</i> .. ..	×	×	×	×
<i>australis</i> n. subsp. .. ..				
<i>Raphicerus</i> sp. .. ..	×	×		×
Family <i>Hippopotamidae</i>				
<i>cf. Hippopotamus</i> sp. .. ..	×			
Order <i>PERISSODACTYLA</i>				
Family <i>Rhinocerotidae</i>				
<i>Diceros simus</i> .. ..	×			
<i>Incertae sedis</i> .. ..	×	×		×
Family <i>Equidae</i>				
<i>Equus</i> sp. .. ..	×			
Order <i>CARNIVORA</i>				
Family <i>Hyaenidae</i>				
<i>Hyaena brunnea</i> .. ..	×	×		
Family <i>Felidae</i>				
(?) <i>Felis serval</i> .. ..	×			
<i>Felis leo</i> .. ..	×	×		
Family <i>Canidae</i>				
<i>Lycaon pictus</i> .. ..	×			
<i>cf. Canis</i> sp. .. ..	×	×		
<i>Canis cf. mesomelas</i> .. ..	×	×		×
Family <i>Viverridae</i>				
(?) <i>Herpestes ichneumon</i> .. ..	×			
Family <i>Mustelidae</i>				
<i>Mellivora capensis</i> .. ..	?			×
<i>Aonyx</i> sp. .. ..				×
<i>Incertae sedis</i> (+1) .. ..	×	×		
Order <i>RODENTIA</i>				
Family <i>Bathyergidae</i>				
<i>Bathyergus suillus</i> .. ..	×			
<i>Incertae sedis</i> (3) .. ..	×			



	Site I	Site II	Site II Extn.	Singer/Fuller Occur.
Class <i>AVES</i>				
Order <b>STRUTHIONIFORMES</b>				
Family <b>Struthionidae</b>				
<i>Struthio australis</i> .. ..	×	×	×	
Class <i>REPTILIA</i>				
Order <b>CHELONIA</b>				
<i>Incertae sedis</i> .. ..		×		

TABLE 3  
THE FOSSIL MATERIAL RECOVERED FROM THE THREE SITES

	Cranial pieces	Min. no. indiv. based on skull	Identified post- cranial pieces	Min. no. indiv. based on Postcranial skeleton	Unident frags.	Complete ostrich egg	Frag. ostrich-eggshell	Frag. tortoise carapace	Coprolites
Site I .. ..	270	45	700	25	1630	—	199	—	7
Site II .. ..	12	8	100	12	119	1	33	1	—
Site II Extn. .. ..	6	3	13	3	34	—	2	—	5
Totals .. ..	288	56	813	40	1783	1	234	1	12

#### SYSTEMATIC DESCRIPTION OF FAUNAL TYPES

The specimen numbers are those in the accession registers for the Swartklip area in the Subdepartment of Quaternary Palaeontology, South African Museum, and all comparative material referred to is in the collections of this museum.

Unless otherwise stated the material described is from Site I. Measurements are in millimetres.

Where possible the nomenclature follows that of Ellerman *et al.* (1953). An exception to this is the use of the generic name *Felis* for the lion, in place of *Panthera* (Herschkovitz, 1959).

#### Family **Bovidae**

##### Tribe *Reduncini*

*Redunca* cf. *arundinum* Boddart

#### Reedbuck

At Site I a minimum of six individuals were represented, while there was at least one from both Sites II and II Extension.

ZW 376—(♂) (table 4, pl. 2A, B)—This is the skull of an adult, with the braincase almost intact, but having lost the tympanic bullae, most of the basioccipital, the sphenoid, the zygomatic arches, and parts or all of other delicate features from the base of the skull. Both horn cores have lost part of their distal extremities. The frontals are largely intact above the supraorbital foramina, but those parts forming the roof of the orbits have been lost.

TABLE 4  
DIMENSIONS OF ♂ *Redunca arundinum* SKULLS COMPARED WITH THOSE  
OF TWO FOSSIL SPECIMENS FROM SWARTKLIP

	Fossil Specimens		Modern <i>R. arundinum</i> (♂) No.			
	ZW 376	ZW 1316	Mean	Range	Measured	
Postorbital constriction ..	c75.0	76.0	69.5	—	1	
Max. length across occipital condyles .. .. .	59.5	58.8	57.2	56.5–57.7	4	
Max. skull width in occipital plane .. .. .	102.5	102.1	98.2	94.7–101.0	4	
Height from most superior point of foramen magnum to lambda* .. .. .	35.0	36.8	37.5	36.8–38.6	4	
Dimensions of horn pedicle {	Ant./Post. ..	35.9	35.5	35.1	31.9–38.0	4
		Transverse ..	38.0	34.0	34.3	32.2–36.6
Skull width at horn pedicles ..	102.4	105.6	99.7	95.4–102.0	4	

\* Point on median line contact of occipital and parietal.

ZW 1316—(♂) (table 4, pl. 2C)—The skull of an adult from Site II. It corresponds closely in size and morphology to ZW 376. Except for the horn cores, of which only the bases remain, it is more complete than ZW 376, and lacks only the facial region, the zygomatic arches, the tympanic bullae and rims of the orbits.

The braincases of these two specimens have distinctly flattened dorsal surfaces, with the nuchal crests not as strongly arched as in the comparative specimens. This morphological difference is not clearly expressed by the skull dimensions, the width/height ratio being 1:2.8 in the fossil specimens and 1:2.6 for the mean of the comparative series. It has clearly resulted from an upward expansion of the braincase on either side of the median line. In all other observable respects the two fossil skulls were similar to those of the comparative series.

ZW 74—(♀) (tables 5 & 6, pl. 2D)—The almost intact skull of a young adult, with the M<sup>3</sup> incompletely erupted. It lacks the nasals, the premaxillae and parts of the maxillae, and is slightly damaged in the parietal and occipital

regions. All the molars are present and well preserved, as is the left P<sup>4</sup>. The specimen ZW 712, a fragment of right maxilla with the P<sup>2</sup>, P<sup>3</sup>, and P<sup>4</sup> belongs almost certainly to ZW 74.

TABLE 5

DIMENSIONS OF ♀ *Redunca* cf. *arundinum* SKULL FROM SWARTKLIP (ZW 74)

Postorbital constriction	..	..	..	..	..	..	..	..	70.2
Length between external occipital protuberance and bregma	..	..	..	..	..	..	..	..	76.3
Width between external alveolar margins at midpoints of M <sup>1</sup>	..	..	..	..	..	..	..	..	71.7
Height from basioccipital to most superior point of occipital	..	..	..	..	..	..	..	..	56.4

No female *R. arundinum* skulls were available for comparison, and consequently no conclusions could be drawn as to the relative size and morphology of the fossil specimen.

In addition twenty-two isolated upper teeth and maxillary fragments were assigned to *Redunca*. These included deciduous teeth. The permanent teeth were, without exception, longer than those of the comparative specimens, while the breadths were greater than, or near the top of the range of the comparative series (table 6). The six modern *R. arundinum* skulls examined were those of males with horn lengths ranging from 24 cm to 30 cm along the front curve. They were, therefore, above average size for the species (Ward, 1899).

TABLE 6

DIMENSIONS OF UPPER TEETH OF *Redunca arundinum* COMPARED WITH THOSE OF FOSSIL SPECIMENS FROM SWARTKLIP

	Fossil Specimens				Modern <i>R. arundinum</i> (♂)			
	ZW 74	ZW 712	ZW 80	ZW 392	Mean	Range	No. Measured	
P <sup>2</sup>	{1 ..	—	7.0	—	—	6.4	5.5-7.2	2
	{b ..	—	5.9	—	—	5.2	4.8-5.4	2
P <sup>3</sup>	{1 ..	—	c9.5	—	—	8.6	7.9-9.1	4
	{b ..	—	8.0	—	—	8.5	8.3-9.0	4
P <sup>4</sup>	{1 ..	11.0	10.9	—	—	9.1	8.3-9.7	5
	{b ..	9.4	9.1	—	—	8.7	7.8-9.1	4
M <sup>1</sup>	{1 ..	c16.5	—	—	17.5	12.2	10.4-13.8	6
	{bm ..	12.8	—	—	10.7	11.2	10.7-11.7	3
	{bd ..	12.1	—	—	9.4	10.9	10.1-12.2	5
M <sup>2</sup>	{1 ..	17.9	—	—	18.0	13.9	12.1-15.0	6
	{bm ..	12.1	—	—	9.9	10.9	9.8-11.7	6
	{bd ..	10.8	—	—	8.0	10.2	9.5-10.8	4
M <sup>3</sup>	{1 ..	17.2	—	17.9	—	15.3	13.3-17.3	6
	{bm ..	10.4	—	11.3	—	10.0	8.8-10.8	5
	{bd ..	9.2	—	9.7	—	8.5	7.8-9.1	5

Sixteen mandibles, mandible fragments, and isolated lower teeth of *Redunca* were also included in the assemblages, but since no mandibles of the modern reedbuck were available for comparison, they were not studied in detail.

The available evidence suggests that the Swartklip *Redunca* is at least

subspecifically distinct from the extant form. In view of the inadequate range of comparative material, the degree of difference could not be accurately assessed, and the fossil material is therefore only tentatively assigned to *R. arundinum*.

Tribe *Hippotragini*  
*Hippotragus* cf. *leucophaeus* Pallas

Blue Antelope

The remains of at least four individuals were recovered at Site I.

The tentative conclusion on the presence of the recently extinct blue antelope was based on three specimens, which belong almost certainly to a single individual.

ZW 355—(tables 7, 8 & 9, pl. 5A, B)—A right mandible with a complete set of moderately worn cheek teeth.

ZW 375—An incomplete left mandible with P<sub>4</sub>—M<sub>3</sub>.

ZW 357—RP<sup>2</sup>.

The incisal alveolar region of ZW 355 is missing, as is much of the ascending ramus, and that part of the mandible in the region of the angle. The teeth and remainder of the corpus are well preserved. The teeth are clearly hippotragine, but differ significantly from those of the extant roan (*H. equinus*) and sable (*H. niger*) antelopes. They do, however, closely resemble the teeth of the type specimen of *H. problematicus* Cooke (1947). This specimen is from Bloembos, near Darling, about 50 miles north of Swartklip.

In *H. problematicus* (SAM 661A & B) the premolar series is proportionately longer than the molar series, the premolars resembling those of the roan antelope, while the molars are intermediate between those of the roan and sable antelopes (Cooke, 1947). This feature is also exhibited by the Swartklip specimen (table 7).

TABLE 7  
THE LENGTHS OF THE CHEEK TEETH SERIES OF THE SWARTKLIP *Hippotragus*,  
COMPARED WITH THOSE OF OTHER HIPPOTRAGINES

	ZW 355	<i>H. problematicus</i> * (S.A.M. 661A)	<i>H. equinus</i> * (Mean)	<i>H. niger</i> * (Mean)
P <sub>2</sub> —P <sub>4</sub> length .. ..	51.2	53.0	51.0	45.0
M <sub>1</sub> —M <sub>3</sub> length .. ..	70.2	71.0	78.0	68.0

\* Cooke, 1947.

In general the teeth of ZW 355 correspond closely to those of the *H. problematicus* type specimen in size, although the M<sub>2</sub> and M<sub>3</sub> are slightly narrower (table 8). Morphologically the differences are also slight. The anterior accessory cusp of the P<sub>2</sub> of SAM 661A is seen on the lingual surface as a clearly defined vertical pillar, whereas in that of ZW 355 the base of the cusp broadens out

posteriorly and is not as well defined as an 'accessory' feature. The  $P_4$  of ZW 355 has a small accessory cusp developed on the anterior part of the buccal surface, and this is not present on the  $P_4$  of SAM 661A. In ZW 355 the anterior enamel folds are more strongly developed than those of SAM 661A. In the  $M_2$  of ZW 355 the external accessory pillar between the lobes is separated from the folds of buccal enamel, whereas in SAM 661A it has been incorporated. Usually this might be ascribed to different degrees of wear, but the teeth of the two specimens have very similar crown heights.

TABLE 8  
DIMENSIONS OF THE LOWER TEETH OF THE SWARTKLIP *Hippotragus*, COMPARED  
WITH THOSE OF THE TYPE SPECIMEN OF *H. problematicus*

	ZW 355	S.A.M. 661A
$P_2^*$ { 1 ..	15.0	14.8
{ b ..	11.9	11.6
$P_3^*$ { 1 ..	17.0	17.4
{ b ..	14.0	14.3
$P_4^*$ { 1 ..	18.6	19.1
{ b ..	14.8	14.1
$M_1^\dagger$ { 1 ..	20.0	19.3
{ bm ..	13.1	13.7
{ bd ..	12.1	c12.0
$M_2^\dagger$ { 1 ..	22.5	23.0
{ bm ..	11.9	13.4
{ bd ..	12.0	12.8
$M_3^\dagger$ { 1 ..	28.7	30.1
{ bm ..	11.2	12.5
{ bd ..	10.8	11.8

\* Maximum dimensions midway up crown.

† Dimensions at occlusal surface.

The two specimens differ most widely in the relative sizes of their mandibular corpora, the Swartklip specimen being considerably more robust (table 9). This is possibly a reflection of a difference in sex.

Cooke (1947) suggested that *H. problematicus* may prove to be a synonym of *H. leucophaeus* Pallas, which became extinct in the Cape Province at the end

TABLE 9  
DIMENSIONS OF THE MANDIBULAR CORPUS OF THE SWARTKLIP *Hippotragus*,  
COMPARED WITH THOSE OF THE TYPE SPECIMEN OF *H. problematicus*

	ZW 355	S.A.M. 661A
Height below midpoint of $M_3^*$ ..	c62.0	—
Height below midpoint of $M_1^*$ ..	53.4	44.0
Height below midpoint of $P_2^*$ ..	40.0	30.9
Distance between post. end of mental foramen and ant. end of $P_2$ .. .. .	46.8	40.0

\* Measured on lingual surface.

of the eighteenth century. Later he expressed reservations on this question as a result of information supplied him by the late Robert Broom (Cooke, 1955), but as far as can be determined Broom's opinion remains unsubstantiated.

Nevertheless, in view of the geographical position of Swartklip and the relatively recent age of the fossils (*vide infra*), it is considered that sufficient justification exists for tentatively assigning the Swartklip hippotragine material to *H. leucophaeus*.

The specimen ZW 357 (RP<sup>2</sup>) is considerably larger than the corresponding teeth of the roan and sable antelope comparative specimens, having a maximum length of 18·3 and a maximum breadth of 22·1 mm.

Tribe *Alcelaphini*  
cf. *Connochaetes* sp.

The minimum number of alcelaphines represented was three. All the specimens recovered were assigned to the genus *Connochaetes* (*sensu lato*) (pl. 5D).

In general the material showed greater affinities to *C. gnou*, rather than *C. (Gorgon) taurinus*, but owing to the lack of adequate comparative information, no conclusion on the specific rank of the fossil form was reached.

Tribe *Antilopini*

***Antidorcas marsupialis australis* n. subsp.**

*Diagnosis*

An *Antidorcas* differing from the extant *A. marsupialis* principally in the size and shape of the horn cores of the male. They are notably more slender in the fossil form, being intermediate in size between those of the male and female of the modern form. Although lyrate in shape they show no indication of an inward curve towards the tip. They rise vertically above the orbits as in the modern form, but then have only a slight backward sweep. The braincase of the fossil specimens is slightly longer and lower than that of the extant springbok, but in general its morphology is similar. A notable exception is that the basioccipital and body of the sphenoid of the new subspecies lie in a plane with the inferior margin of the occipital condyles, whereas in the modern springbok the sphenoid curves upwards fairly sharply immediately anterior of the basilar tubercles.

Morphologically the teeth of the modern and fossil forms are indistinguishable, although those of the new subspecies tend to be rather narrow.

*Material*

ZW 66—(♂) (table 10, pl. 3)—The skull of an adult consisting of a complete braincase and frontlet. The left horn core is intact, but only the base of the right core is preserved. The braincase has suffered some slight superficial damage, and delicate parts such as the tympanic bullae have been lost. The left horn core, from which the extreme tip is missing, is damaged on the

TABLE 10  
 DIMENSIONS OF THE SKULLS OF *Antidorcas marsupialis australis* n. subsp. FROM SWARTKLIP COMPARED  
 WITH THOSE OF THE MODERN SPRINGBOK

	ZW 66				ZW 67A				ZW 402				ZW 1317				<i>A. marsupialis</i> ♀			<i>A. marsupialis</i> ♂		
	Mean	Range	No. measured		Mean	Range	No. measured		Mean	Range	No. measured		Mean	Range	No. measured	Mean	Range	No. measured	Mean	Range	No. measured	
Max. skull width at horn pedicles ..	67.8	c64.0	c65.0	74.7												58.5	52.5-61.6	3	75.3	70.2-79.8	9	
Width between horn cores ..	19.0	c19.0	c21.0	c21.0												28.0	25.0-31.9	3	18.6	16.0-21.8	6	
Dimensions of horn pedicle {	28.7	28.8	27.0	c32.5												18.9	14.0-22.7	3	37.2	33.0-40.1	9	
	24.0	21.2	22.2	27.3												15.6	12.7-18.8	3	29.7	25.9-32.3	8	
Height from base of foramen magnum to top of external occip. protuberance	40.3	—	c40.0	—												38.9	—	1	42.5	41.0-43.8	4	
Length between ext. occip. protuberance and bregma ..	70.0	—	66.5	—												60.8	—	1	64.4	64.0-65.0	4	
	44.0	—	c46.0	—												40.0	—	1	43.6	41.6-47.0	4	
Max. skull width at mastoid processes ..	79.0	—	—	—												69.2	—	1	79.7	77.8-82.9	4	
Max. width across parietals ..	68.8	—	c66.0	—												62.8	—	1	66.1	61.6-67.5	4	

anterior surface of the proximal end. There is, however, no indication of transverse ridges on this, or any of the other horn cores.

*ZW 402*—(♂) (table 10, pl. 4A)—The skull of an adult consisting of the frontlet, left and right horn cores and incomplete braincase. The tip of the left horn core is missing. The base and sides of the braincase are extensively damaged, and approximately fifty fragments of bone from this region were not restored to the skull. The largest of these fragments includes the basi-occipital with the right occipital condyle, and the sphenoid. This specimen compares remarkably closely with *ZW 66* in all observable respects.

*ZW 67a*—(♂) (table 10, pl. 4B)—The right horn core and part of the frontal of an adult. It corresponds closely with *ZW 66* and *ZW 402* in all observable respects.

*ZW 1317*—(♂) (table 10)—An incomplete and heavily weathered skull from Site II, with only the base of the horn cores and part of the frontal and parietal remaining. The dimensions of the horn cores correspond more closely with those of the comparative specimens than do any of the others.

*ZW 48*—(♀)—The only female specimen known from Swartklip, having come from the Singer/Fuller Occurrence, and referred to *Antidorcas marsupialis* or *Gazella wellsi* Cooke by them. The specimen consists of an incomplete left horn core and part of the frontal. Owing to its condition, accurate measurements were not possible, but it appears to fall within the range of variation of the female springbok.

*ZW 68*—A fragment of the roof of a braincase, very similar to the corresponding parts of *ZW 66* and *ZW 402*.

*ZW 69*, *ZW 70* & *ZW 71*—Horn core fragments, indistinguishable from the corresponding parts of the more complete specimens.

*ZW 151* & *ZW 161*—LM<sup>3</sup> and incomplete RM<sup>3</sup>, indistinguishable from the M<sup>3</sup> of the modern springbok.

*ZW 1571*—LM<sup>1</sup> from Site II Extension, somewhat smaller than the M<sup>1</sup> of the comparative specimens.

*ZW 81* & *ZW 82*—(table 11, pl. 4C)—Incomplete left mandibles, with the P<sub>3</sub> lost from both specimens. As is characteristic of *Antidorcas* there is no P<sub>2</sub>. In all respects these specimens correspond closely to the comparative series.

### Discussion

The minimum number of individuals represented in the Site I assemblage was four, while there was at least one from both Site II and II Extension.

Three subspecies of *Antidorcas marsupialis* Zimmerman are generally recognized: *marsupialis* in the Transvaal, Orange Free State and south of the Orange River; *angolensis* in the Kaokoveld and northern Namib Desert; and *hofmeyri* in Great Namaqualand and the Kalahari Desert (Roberts, 1951; Ellerman *et al.*, 1953).



TABLE 11  
 DIMENSIONS OF THE LOWER TEETH OF THE FOSSIL *Antidorcas* FROM  
 SWARTKLIP COMPARED WITH THOSE OF THE MODERN SPRINGBOK

		ZW 81		Modern springbok (3 specimens)	
				Mean	Range
P <sub>4</sub>	{ 1 ..	—	8.6	8.9	7.7-10.0
	{ b ..	—	5.0	5.3	4.4-6.0
M <sub>1</sub>	{ 1 ..	13.0	12.5	13.1	11.7-14.0
	{ bm ..	6.1	6.4	6.8	6.5-7.0
	{ bd ..	6.7	6.9	7.8	6.9-8.2
M <sub>2</sub>	{ 1 ..	14.5	14.9	14.9	12.8-16.4
	{ bm ..	6.2	7.1	7.4	7.3-7.4
	{ bd ..	6.4	7.3	7.7	7.3-8.4
M <sub>3</sub> *	{ 1 ..	20.4	21.4	23.2	22.9-23.8
	{ bm ..	5.5	7.0	7.2	6.7-7.8
	{ bd ..	5.7	7.2	7.6	6.9-8.3
M <sub>1</sub> -M <sub>3</sub>	..	48.1	47.6	50.0	46.1-53.0

\* M<sub>3</sub> of ZW 81 incompletely erupted.

Unfortunately the localities from which the comparative specimens came were not all known, but at least three of the males were from South West Africa. These were, therefore, probably either *angolensis* or *hofmeyri*, while most of the others were almost certainly *marsupialis*. Blaine (quoted by Roberts, 1951) in his definition of *angolensis* stated that the horns of this subspecies are not as stout at the base as those of *marsupialis*, while the skull is, 'relatively longer, narrower and vertically less deep'. This description could apply to the new subspecies, but Thomas (1926) in his definition of *hofmeyri* stated that it has the 'same long heavy horns' of *angolensis*. Consequently since the horns of these two subspecies are apparently similar, and since the comparative series included specimens of at least one of them, the characteristics defined by Blaine are obviously not of a degree sufficient to make the horns of *angolensis* comparable in size to those of the new subspecies.

Clearly then the horns of the males of the extant subspecies, although variable, differ significantly from those of the fossil specimens. These are gracile, not heavily ridged, do not have the marked sweep posteriorly, and do not appear to recurve inwards towards the tip. They show a considerably greater divergence in character to those of the extant subspecies than these show relative to one another.

Gentry (1964) has shown the importance of the transverse compression of horn cores in the classification of gazelles, and applying his method of quantitatively expressing this feature, it was found that the horn cores of the Swartklip *Antidorcas* correspond very closely to those of the modern springbok (table 12). In this respect at least, the horns of the modern and fossil forms are similar.

The angulation of the sphenoid relative to the basioccipital in the modern

springbok is a feature which relates directly to the size and orientation of the horns. Gentry (1964) has indicated the relationship between the degree of development of the basilar tubercles and horn size in gazelles, and in the slender-horned Swartklip *Antidorcas* these tubercles are indeed less pronounced than in the modern springbok. With the marked backward sweep of the horns in the latter, an adaptation of the angle of attachment of the neck muscles to the skull would be necessary to compensate for the relative posterior shift in weight of the horns. This requirement could be met by the downward movement of the basioccipital relative to the sphenoid. The basioccipital of the new subspecies is somewhat more rectangular than that of the modern springbok and this feature, together with the slightly shorter and lower braincase, are probably related expressions of the same factor.

TABLE 12  
THE TRANSVERSE COMPRESSION\* OF THE SWARTKLIP *Antidorcas*  
HORN CORES COMPARED WITH THAT IN A SERIES OF MODERN SPRINGBOK

	Transverse diameter		
	× 100		
	Antero-posterior diameter		
	Mean	Range	No. measured
Swartklip specimens ..	80·85	73·6-84·0	4
Modern <i>A. marsupialis</i> ♂	80·56	75·7-87·3	8
Modern <i>A. marsupialis</i> ♀	83·47	76·9-90·7	3

\* Gentry, 1964.

Recently Gentry (1966) has recorded from Beds I and II at Olduvai Gorge, a series of gazelline horn cores (his Group (B): 65-66, pl. 2C) which, as far as can be determined, compare closely to those of the Swartklip *Antidorcas*. He refers these specimens tentatively to *Gazella*, but concludes that they are unlike the horn cores of any living gazelle. The illustrated specimen (1953, SHK II, 285) in lateral view is very similar to the Swartklip horn cores, and its dimensions (28·2 × 23·1 mm) fall within the range of variation of the Swartklip specimens. If this Olduvai Gorge form is indeed the same as that from Swartklip, it indicates a wide temporal and geographical range for the animal. It is also almost certainly present at the Elandsfontein (Hopefield) site, where a number of horn cores and dentitions of this and other Antilopini have been recovered.

The taxonomic status of the Swartklip *Antidorcas* does, in part, hinge on the question of the geographical distribution of this genus. The extant subspecies of the springbok are plains-dwelling animals confined largely to the inland plateau and the western coastal region of southern Africa (Ellerman *et al.*, 1953; Roberts, 1951). The natural pattern of their distribution has been extensively disrupted by human settlement, and while the springbok may have occurred in the south-western Cape during the seventeenth century, no historical records to this effect could be located. If it was indeed present, there

will certainly be no adequate descriptions of the physical character of the local form available, and reference to the fossil record must therefore be made. The Swartklip fossils do indicate the presence of a springbok differing slightly from the subspecies occurring further north.

In the light of available evidence it is concluded that the Swartklip *Antidorcas* is at least a geographical variant of the extant species, and in view of the location of the sites, the taxon *Antidorcas marsupialis australis* is proposed. However, if the suggested wider relationships of this form can be convincingly demonstrated, its elevation to the species level will need to be considered.

Tribe: *Neotragini*

*Raphicerus* sp.

The minimum number of neotragine antelope represented in the Site I assemblage was six, while a single individual was represented at Site II.

The two extant South African species of *Raphicerus*, namely *campestris* (steenbok) and *melanotis* (grysbok), cannot be satisfactorily distinguished on osteological grounds. Both are found in the south-western Cape Province today, and the Swartklip specimens show no significant differences from the living forms.

Singer & Fuller (1962) stated that the *Raphicerus* specimens recovered by them had closer affinities to the recent forms than to the fossil form from the Elandsfontein site.

Family **Bovidae**: *Incertae sedis*

Almost one hundred skull fragments and isolated teeth, mostly incomplete, from the Site I assemblage were not classified, but none suggested the presence of an antelope other than those already listed.

Family **Hippopotamidae**

cf. *Hippopotamus* sp.

A single unerupted (? deciduous) tooth, doubtfully ascribed to the hippopotamus, was included in the Site I assemblage.

Family **Rhinocerotidae**

*Diceros* (*Ceratotherium*) *simus* Burchell

White Rhinoceros

Remains of the rhinoceros were rare in all the assemblages, and only a single unerupted RP<sup>3</sup> (ZW 192) from Site I was identified positively as belonging to *Diceros simus*. This species was not recorded in the south-western Cape Province during historic times, but has been recorded from the Langebaanweg, Hopefield and Melkbos fossil sites.

*Diceros* sp.

The only other cranial remains of the rhinoceros recovered were four tooth fragments. Owing to their condition it was not possible to assign them to any species.

Six elements of the postcranial skeleton were recovered from Sites I and II, including a radius and ulna (ZW 292 and ZW 1120) found in close association at Site I.

It is generally considered impossible to distinguish the white from the black rhinoceros on the basis of their postcranial skeleton (Hooijer & Singer, 1960), but the specimens from Site I compared closely in size with corresponding elements of the skeleton of a white rhinoceros in the South African Museum (SAM 21379). However, the postcranial material recovered may belong in part, or entirely to the black rhinoceros (*Diceros bicornis*), which was recorded in the area during historic times, and which is commonly found at other fossil sites in the area.

Family **Equidae***Equus* sp.

No cranial remains of this genus were recovered, but several elements of the postcranial skeleton were included in the Site I assemblage. They represent the remains of at least two individuals, an adult and a juvenile.

Family **Hyaenidae***Hyaena brunnea* Thunberg

## Brown Hyena

The minimum number of individuals represented in the assemblages was three.

ZW 394—A right premaxilla, probably of an immature adult, with only the I<sup>2</sup> remaining in position. This tooth is fully erupted, but unworn.

ZW 1311—(table 13, pl. 6A, B)—An incomplete skull of an immature individual from Site II, with associated right and left mandibles (ZW 1312 & ZW 1313). The facial part of the skull is largely intact, but most of the brain-case has been lost. The teeth preserved are as follows:

*Left*: Roots of I<sup>1</sup> and di<sup>3</sup>; I<sup>2</sup> and I<sup>3</sup> about to erupt; root and damaged crown of d<sub>c</sub>; P<sup>1</sup>; dp<sup>2</sup>; dp<sup>3</sup>; dp<sup>4</sup>; P<sup>4</sup> about to erupt; M<sup>1</sup> just erupted.

*Right*: As above, except that the I<sup>1</sup> is intact, only the posterior root of the dp<sup>2</sup> remains, and the P<sup>1</sup> has been lost.

The right mandible (ZW 1312—pl. 6C) has the following teeth present: I<sub>1</sub>; d<sub>c</sub>; dp<sub>2</sub>; dp<sub>3</sub>; dp<sub>4</sub>; and M<sub>1</sub> partially erupted.

The left mandible (ZW 1313) is incomplete, and only the dp<sub>3</sub> and part of the dp<sub>2</sub> are preserved.

TABLE 13  
DIMENSIONS OF THE TEETH OF AN IMMATURE *Hyaena brunnea*,  
SPECIMEN (ZW 1311) FROM SWARTKLIP

P <sup>1</sup>		dp <sup>2</sup>		dp <sup>3</sup>		dp <sup>4</sup>		M <sup>1</sup>		P <sup>1</sup> - dp <sup>4</sup>
l	b	l	b	l	b	l	b	l	b	
7.3	7.6	13.5	c7.2	24.1	13.3	9.6	14.2	c12.5	6.4*	51.5

\* At midpoint of tooth.

No skulls of immature brown hyenas were available for comparative purposes, but the permanent teeth present corresponded closely with those of the adult comparative specimens.

A fragment of right maxilla (ZW 141) with the dp<sup>3</sup> and dp<sup>3</sup> from Site I, closely resembled the corresponding part of ZW 1311 in all observable respects.

### Family **Felidae**

#### ? *Felis serval* Schreber

#### Serval Cat

At least two individuals were represented in the Site I assemblage.

ZW 110—(table 14, pl. 7C)—An incomplete skull of a small felid consisting of the braincase, the posterior part of the palate and left maxilla, and the left carnassial. This tooth was somewhat shorter than those of modern serval cats (Roberts, 1951), but since it is poorly preserved the dimension given may be inaccurate. An isolated felid P<sup>4</sup> from the Site I assemblage (ZW 183) has a length of 14.0 mm, which is within the range of variation for this species.

TABLE 14  
DIMENSIONS OF THE SKULL OF A ? *Felis serval* FROM SWARTKLIP  
COMPARED WITH THOSE OF MODERN SPECIMENS

	ZW 110	<i>Felis serval</i> subsp.*					
		♂	♀	3 adult ♂		♂	♂
				Min.	Max.		
Intertemporal constriction	30.8	—	30.0	29.5	35.0	32.5	35.2
Braincase width .. ..	52.2	—	49.7	52.5	56.0	52.5	52.6
Bullae—greatest diameter	c24.5	26.5	23.5	25.5	27.5	26.5	25.0
P <sup>4</sup> length .. .. .	c12.0	16.0	13.0	13.9	15.3	14.0	14.8

\* Roberts, 1951.

ZW 377—The anterior part of the snout of a small felid, with the LI<sup>1</sup>, LI<sup>2</sup>, RI<sup>2</sup>, RI<sup>3</sup> and RC.

Owing to the lack of comparative material these specimens are only doubtfully referred to *Felis serval*.

*Felis leo* Linnaeus

## Lion

A minimum of four individuals was represented in the Site I assemblage, and one in the Site II assemblage.

ZW 100—(pl. 7A)—An incomplete skull consisting of the braincase and part of the frontals. The occipital is intact except for that part in the region of the left mastoid process. The right tympanic bulla is slightly damaged and the left completely absent. The right temporal is complete and both the articular groove and postglenoid process are present. The basioccipital and sphenoid are largely intact. The left side of the braincase is damaged and most of the parietal and temporal have been lost.

This specimen was morphologically indistinguishable from the skulls of the modern lion examined, and in size fell within the range of variation of the comparative series.

ZW 101—An incomplete braincase lacking the top of the nuchal crest, the sagittal crest and immediately adjacent parts. It compares closely in all observable respects with ZW 100, but is less well preserved.

ZW 131 (& ZW 174)—An incomplete left maxilla with the  $dp^3$ ,  $dp^4$  and the  $M^1$  just erupting. The  $C$ ,  $P^3$  and  $P^4$  are present but unerupted. The unerupted teeth and the  $M^1$  were similar in all respects to those of the comparative series.

ZW 106—(pl. 7B)—A left maxillary fragment with the  $dp^2$  and  $dp^3$ , and the unerupted  $P^4$ .

Eight other isolated deciduous or unerupted permanent teeth were recovered, in addition to a fragment of right maxilla (ZW 144), which belongs almost certainly with ZW 106.

The deciduous teeth show all the characteristics of those of the modern lion (Broom, 1949).

Few elements of the postcranial skeleton were recovered. A first phalanx (ZW 237), two fragments of a right radius (ZW 350 and ZW 526) and the distal end of an ulna (ZW 1209) were the only postcranial remains of adults recovered, the last-mentioned from Site II. A single metapodial (ZW 261) of an immature individual came from Site I. None of these specimens, with the possible exception of the ulna, was of unusual size.

Family **Canidae***Lycaon pictus* Temminck

## African Hunting Dog

Two isolated teeth, a  $LI^2$  (ZW 137) and an incomplete  $RI^3$  (ZW 177), were assigned to this species. They were indistinguishable in all respects from the corresponding teeth of the comparative series.

cf. *Canis* sp.

$\zeta W 1314$ —A left maxillary fragment with the  $P^4$  and  $M^1$  from Site II. While the teeth resemble those of *Canis* morphologically, they fall beyond the size range of variation of the two extant South African jackals (*C. mesomelas* and *C. adustus*).

$\zeta W 108$ —A canine which is significantly larger than those of the two extant jackals, but appreciably smaller than that of *Lycan pictus*.

*Canis* cf. *mesomelas* Schreber

## Black-backed Jackal

This was the most commonly represented carnivore at Site I, the remains of at least six individuals being present.

The tentative diagnosis of the specimens was based principally on the size of the lower carnassials, and the carnassial: molar ratio (Ewer, 1956a), which excluded the possibility of the material belong to the side-striped jackal (*C. adustus*) (tables 15, 16).

TABLE 15

DIMENSIONS OF THE LOWER TEETH OF *Canis* cf. *mesomelas* FROM SWARTKLIP COMPARED WITH THOSE OF A SERIES OF TEN *C. adustus* AND FOURTEEN *C. mesomelas*

	Swartklip specimens			<i>C. adustus</i> *		<i>C. mesomelas</i> *	
	Mean	Range	No. measured	Mean	Range	Mean	Range
$P_1$ {1 ..	4.2	—	2	3.4	2.9-4.0	4.0	3.4-4.8
$P_1$ {b ..	3.3	—	2	2.3	2.0-2.7	2.7	2.3-3.2
$P_2$ {1 ..	8.5	8.1-8.9	3	7.6	7.2-8.2	8.0	7.2-9.0
$P_2$ {b ..	4.0	3.8-4.4	3	3.1	2.8-3.5	3.3	2.4-3.8
$P_3$ {1 ..	9.4	9.1-9.7	4	8.6	8.0-9.0	8.8	7.1-10.0
$P_3$ {b ..	4.4	4.1-4.6	4	3.4	2.8-4.4	3.5	3.0-4.0
$P_4$ {1 ..	10.9	10.5-11.3	4	9.8	9.3-10.6	10.3	9.2-11.5
$P_4$ {b ..	4.9	4.4-5.4	4	4.2	3.7-4.7	4.3	3.6-4.8
$M_1$ {1 ..	20.5	19.6-21.0	5	16.2	15.0-17.4	18.8	16.5-20.7
$M_1$ {b ..	8.7	8.4-9.3	5	6.1	5.1-6.8	7.2	6.5-8.2
$M_2$ {1 ..	8.7	8.0-9.4	6	9.4	8.7-10.0	8.5	7.4-9.6
$M_2$ {b ..	6.7	6.0-7.1	6	6.5	5.2-7.0	6.3	5.7-7.0
$M_3$ {1 ..	4.5	—	1	4.6	4.3-5.0	4.2	3.5-4.9
$M_3$ {b ..	4.1	—	1	3.9	3.5-4.5	3.8	3.3-4.3
$P_1 - P_4$ 1 ..	35.9	34.6-38.0	3	35.0	31.7-36.4	34.8	31.5-37.1
$M_1 : M_2$ 1 ..	2.46	2.35-2.58	3	1.73	1.60-1.81	2.21	1.99-2.57

\* Ewer, 1956a.

Although available evidence indicates the presence of *C. mesomelas* in the assemblages, it may prove on closer examination that *all* the canid material from the Swartklip sites belongs to an extinct member of the family.

TABLE 16  
 DIMENSIONS OF THE UPPER TEETH OF *Canis* cf. *mesomelas* FROM SWARTKLIP  
 COMPARED WITH THOSE OF A SERIES OF TEN *C. adustus* AND FOURTEEN *C. mesomelas*

	Swartklip specimens			<i>C. adustus</i> *		<i>C. mesomelas</i> *		
	Mean	Range	No. measured	Mean	Range	Mean	Range	
I <sup>2</sup>	{1 ..	5.0	—	1	3.6	2.9-4.1	4.4	3.8-5.0
	{b ..	4.8	—	1	—	—	—	—
I <sup>3</sup>	{1 ..	6.4	6.0-7.1	5	4.4	3.8-5.0	5.3	4.6-6.3
	{b ..	5.2	4.9-5.8	5	—	—	—	—
P <sup>1</sup>	{1 ..	5.0	—	1	4.1	3.4-4.9	5.0	4.1-5.8
	{b ..	3.5	—	1	2.5	2.2-2.8	3.0	2.2-3.5
P <sup>2</sup>	{1 ..	9.5	—	1	7.7	7.2-9.0	8.6	7.4-9.6
	{b ..	4.2	—	1	—	—	—	—
P <sup>3</sup>	{1 ..	10.5	—	1	9.2	8.5-9.8	9.6	8.7-11.0
	{b ..	4.9	—	1	—	—	—	—
P <sup>4</sup>	{1 ..	18.5	—	1	14.4	12.8-15.6	17.1	15.0-19.1
	{b ..	9.7	—	1	6.7	5.5-7.7	7.8	6.8-8.7
M <sup>1</sup>	{1 ..	11.0	—	1	11.7	10.4-12.7	11.8	10.3-13.7
	{b ..	15.0	—	1	12.5	10.7-13.3	13.7	11.7-15.5
M <sup>2</sup>	{1 ..	7.3	—	1	7.7	7.0-8.6	6.8	6.2-7.8
	{b ..	10.9	—	1	10.4	9.3-11.8	10.5	9.8-11.5

\* Ewer, 1956a.

### Family Viverridae

#### ? *Herpestes ichneumon* Linnaeus

#### Egyptian Mongoose

A single specimen (ZW 111) (pl. 7D) was doubtfully assigned to this species. It is the crushed skull of a large viverrid which lacks the braincase, the left P<sup>1</sup>, P<sup>4</sup>, M<sup>1</sup> and M<sup>2</sup> and the right P<sup>2</sup>. No comparative material was available and the identification is based on published information (Ewer, 1956b; Roberts, 1951). The teeth of the specimen compare fairly closely in size with those of the extant *H. ichneumon* (table 17).

TABLE 17  
 DIMENSIONS OF THE TEETH OF A ? *Herpestes ichneumon* FROM SWARTKLIP  
 COMPARED WITH THOSE OF THE MODERN FORM

	ZW 111	<i>Herpestes ichneumon</i> *			
C-M <sup>2</sup> length ..	c41.4	38.0	39.1	38.8	40.0
P <sup>4</sup> length ..	c10.3	11.0	11.9	10.7	11.3

\* Roberts, 1951.

As far as can be determined this species has not been recorded in the south-western Cape Province during historic times, but is known to occur in the coastal region further east.



Family **Mustelidae**? *Mellivora capensis* Schreber

## Honey Badger

A left maxillary fragment (ZW 142) from Site I was doubtfully assigned to this species. It is intact up to and including the most anterior part of the orbit. Only the P<sup>2</sup> remains, but the alveolus of the C and the anterior part of the alveolus of the P<sup>3</sup> are preserved.

It corresponds closely in size and general morphology with modern *Mellivora capensis* skulls, and also with fossil specimens from Swartklip (ZW 1, Singer/Fuller Occurrence) and Elandsfontein. However, in ZW 142 the P<sup>2</sup> is situated posterior to the C and is set parallel to the margin of the maxilla, whereas in all the comparative specimens it is at an angle to this margin and overlaps with the posterior margin of the C on its lingual surface.

The alveoli of the C and P<sup>3</sup> were comparable in size to those of the comparative specimens, although the P<sup>2</sup> was large compared with the mean of the comparative series (table 18).

TABLE 18  
DIMENSIONS OF THE P<sup>2</sup> OF THE ? *Mellivora capensis* FROM SWARTKLIP COMPARED  
WITH THOSE OF A SERIES OF MODERN AND FOSSIL SPECIMENS

		ZW 142	<i>Mellivora capensis</i>						
			ZW 1	Hopefield specimens E.C.14 20916A 8640D			Modern specimens 3325 19940 3326		
P <sup>2</sup>	1 ..	6.3	5.3	5.1	5.3	5.1	5.3	6.6	5.8
	b ..	4.4	3.8	3.5	4.0	3.4	3.8	4.3	3.4

**CARNIVORA: *Incertae sedis***

The following specimens were not classified:

ZW 178—An incomplete left mandible with an incisor, canine and premolar of a small carnivore of uncertain affinities.

ZW 143—An incomplete left mandible of an immature individual, with an unerupted canine and premolar, probably belonging to a small felid.

ZW 109—The anterior part of a right mandible with an incomplete deciduous dentition, belonging to a small carnivore.

ZW 136—A canine (?) of a carnivore of uncertain affinities, with an extremely long root relative to the crown height.

ZW 1315—An incomplete canine, possibly belonging to a lion.

Family **Bathyergidae***Bathyergus suillus* Schreber

## Cape Dune Mole

The remains of at least two individuals were present in the Site I assemblage.

ZW 123—An incomplete right mandible with the incisor, both premolars and the first of the molars.

ZW 398—An incomplete left mandible with only the first of the premolars remaining.

ZW 1112—A fragment of left mandible.

ZW 190—A fragment of a left upper incisor.

These specimens were indistinguishable from the corresponding parts of *Bathyergus suillus*, which occurs commonly in the area today.

#### RODENTIA: *Incertae sedis*

Three incisors (ZW 169, ZW 1205 and ZW 1206) representing three distinct types of rodent other than *Bathyergus* were recovered at Site I.

#### Family **Struthionidae**

##### *Struthio australis*

#### Ostrich

In addition to the egg and eggshell fragments already mentioned, the following bones of the ostrich were recovered from Site I:

ZW 208—The shaft of a tibia.

ZW 714—The shaft of a femur.

ZW 948—An incomplete right metatarsal of an immature individual.

ZW 1124 A, B, C—Fragments of the distal end of a femur.

Morphologically the specimens were indistinguishable from the corresponding parts of the extant ostrich, but the tibia shaft was somewhat longer than those of the comparative specimens.

#### CHELONIA: *Incertae sedis*

A single fragment of carapace (ZW 1208) was recovered at Site I.

#### THE POSTCRANIAL REMAINS

Approximately 86% of all the identified postcranial bones recovered came from Site I (table 2), and a summary of the analysis of this material (excluding non-mammalian remains) is given in table 19.

One of the most striking features emerging from this analysis was the scarcity of postcranial remains relative to the number of individuals represented. In the case of the lion, for example, the disparity was very marked. The appendicular skeleton of the lion is made up of approximately 110 bones, excluding the innominates, patellae and sesamoids. With four individuals represented at Site I, theoretically at least 440 bones should have been

TABLE 19  
THE MAMMALIAN POSTCRANIAL REMAINS FROM SITE 1

ZOOLOGICAL GROUPS		Scapulae	Humeri	Ulnae/Radii	Metacarpals	Innominate	Femora	Tibiae	Metatarsals	Carpal/Tarsal	Undifferentiated metapodals	Phalanges	Sesamoids & patellae	Vertebrae	Ribs	Unidentified fragments	TOTALS
CARNIVORA	Felidae— <i>Felis leo</i> ..			2							1	1					4
	Other carnivora ..		5	20			7	3		4	22	16					77
PERISSODACTYLA	Equidae .. ..		1	1						1		2					5
	Rhinocerotidae ..			2	1				1		1	2					7
ARTIODACTYLA	Bovidae .. ..		19	43	21			17	24	33	35	68					260
	.. .. .		2	1			2	1		2							8
RODENTIA	.. .. .		2	1			2	1									
UNDETERMINED	.. .. .	20	10	19		66	46	30		9			7	122	10	1630	1969
	TOTALS .. ..	20	37	88	22	66	55	51	25	49	59	89	7	122	10	1630	2330

Note: Numbers do not necessarily indicate complete bones.

recovered. There were in fact only parts of three bones recovered—less than 1% of the theoretical total. Other figures calculated on this basis ranged up to 20% in the case of the appendicular skeleton of antelope.

The presence of incomplete skeletons at fossil sites is quite common, and many factors might be responsible. Recent work by Brain (1967) is of special interest in the present instance. He has demonstrated by careful field observation that disproportionate occurrences of bones and parts of bones can result from the destructive chewing of small carnivores—domestic dogs in the study undertaken by him. Since carnivores are thought to have been responsible for the fossil assemblages at Swartklip, they were probably also responsible for the destruction of much of the original assemblage. The main objection to this theory is that none of the bones showed signs of tooth marks. The possibility that subsequent weathering has removed all traces of these is considered unlikely, in view of the excellent state of preservation of the specimens.

Clearly allowance must be made for the method of collection, which resulted in only part of the entire deposit being handled. However, this factor alone cannot adequately account for the persistent shortage of postcranial remains of all categories.

In addition there was almost certainly some selective collecting of bone by the inhabitants of the lairs.

It is probably a combination of these factors which has given the assemblage its present character.

A second feature of the postcranial assemblage was the 'completeness' of the bones. A frequently characteristic feature of bone accumulations resulting from the activities of man is the highly fragmented state of the bone (cf. Dart, 1957, for details and references). There are two basic reasons for man's deliberate fragmentation of bone—firstly, to obtain pieces suitable for the manufacture of tools, and secondly, to remove all edible soft tissue. Although the bones from the Swartklip assemblages were often incomplete, this was the result mainly of post-fossilization damage, and as a whole the assemblages lacked large numbers of small bone fragments and splinters. In this respect at least the assemblages had the appearance of animal lair residues, rather than human occupation site debris (Hendey & Singer, 1965: 212).

#### AGE OF THE ASSEMBLAGES

The fauna of the sites is essentially 'modern' in character. No extinct genera are present, and most of the forms are indistinguishable from, or closely related to extant species. The fauna clearly post-dates that of the Elandsfontein site, which is usually termed 'late Middle/early Upper Pleistocene' (Boné & Singer, 1965), and corresponds most closely with that of the Melkbos fossil site (Hendey, in press).

Singer and Fuller (1962) suggested that the assemblage described by them was late Upper Pleistocene, and the present study tends to confirm this, although the possibility that the fauna is post-Pleistocene cannot be discounted.

The application of the name 'Wolfgat' to the area in which the sites are located, suggests the possibility that the lairs in which the fossils accumulated were still being occupied after the arrival of the first settlers from Europe in 1652. It is uncertain when this name was first used but it is most likely to have been during the late seventeenth or early eighteenth centuries. However, even by 1649, before the first permanent European settlement, the indigenous fauna of the Cape Peninsula area was much depleted (Sargent, 1954), and it is concluded from the variety of faunal types represented, that at least part of the assemblages accumulated in prehistoric times.

All the available evidence points to the Swartklip fossils being late Upper Pleistocene or Recent in age.

#### CONCLUSION

The importance of the Swartklip sites lies chiefly in the fact that they have provided the largest range of later Quaternary fossils known from the south-western Cape Province to date. Information on the Quaternary fauna of this region is now coming from the Early or Middle Pleistocene deposits at Langebaanweg, the Middle/Upper Pleistocene site at Elandsfontein and the more recent Melkbos and Swartklip sites. Consequently there is now a proven potential in this limited geographical region for establishing a succession for the Quaternary fauna of southern Africa, a situation unparalleled elsewhere in the subcontinent.

Furthermore the fossils at Swartklip come from sealed deposits where the danger of admixture of earlier and later elements is excluded. This is not the case with the other major sites of the region. The excellent state of preservation of the specimens makes detailed morphological studies of them possible, and there is no doubt that the future exploitation of the sites, and a closer examination of the material already recovered, will provide a great deal of unique and valuable information.

They are potentially the most important fossil occurrences of their kind discovered in southern Africa in recent years.

#### SUMMARY

The fauna of three recently discovered fossil sites in the south-western Cape, South Africa, is described, accounts being given of nineteen mammalian types, including one new subspecies, *Antidorcas marsupialis australis*.

Brief accounts of the geological and archaeological associations of the fauna are given, and the suggestion made that the fossils accumulated in carnivore lairs.

It is concluded that the assemblages are late Upper Pleistocene or Recent in age.

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